Office of Enterprise Assessments Review of the Idaho Cleanup Project Integrated Waste Treatment Unit Federal Readiness Assessment at the Idaho Site

September 2014

Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
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Acronyms

AMWTP	Advanced Mixed Waste Treatment Project
C-RA	Contractor Readiness Assessment
CR	Core Requirement
CRR	Carbon Reduction Reformer
CWI	CH2M-WG Idaho, LLC
DMR	Denitration Mineralization Reformer
DOE	U.S. Department of Energy
DOE-ID	DOE Idaho Operations Office
DOE-RA	DOE Readiness Assessment
EA	DOE Office of Enterprise Assessments
FB	Fluidized Bed
FDC	Facility Design Change
FHA	Fire Hazard Analysis
FPE	Fire Protection Engineer
GAC	Granulated Activated Charcoal
HEPA	High Efficiency Particulate Air
HSS	DOE Office of Health, Safety and Security
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
IP	Implementation Plan
IWTU	Integrated Waste Treatment Unit
NE	DOE Office of Nuclear Energy
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
POA	Plan of Action
QL	Quality Level
RA	Readiness Assessment
SAA	Startup Approval Authority
SAR	Safety Analysis Report
SIF-2	High Temperature Protection System
SMP	Safety Management Program
SSC	Structures, Systems, and Components
SSIS	Safety-Significant Instrumented System
STD	Standard
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question

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EXECUTIVE SUMMARY

The Office of Nuclear Safety and Environmental Assessments within the U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA), Office of Environment, Safety and Health Assessments conducted a review of the Integrated Waste Treatment Unit (IWTU) facility Federal readiness assessment (DOE-RA) at the Idaho Site. As part of the Idaho Cleanup Project, the IWTU contractor, CH2M-WG Idaho, LLC (CWI), is in the process of attempting to restart operations under the line management of the DOE Office of Environmental Management (EM). The facility has been shut down since a June 2012 over pressurization event, which led to multiple corrective actions and redesigned systems. This DOE-RA followed the completed contractor readiness assessment (C-RA) by only a few days.

EA observed a sample of the core requirements (CR) that were evaluated by the DOE-RA team. The selected review areas were the CR 1, *Safety Management Program (SMP) – Fire Protection*, and CR 7, *Safety System Surveillance.*

Overall, the DOE-RA was executed as planned by an experienced and inquisitive DOE-RA team that followed the approved Plan of Action (POA) and Implementation Plan. The DOE-RA team reviewed applicable documentation, observed work activities, and was well prepared to evaluate the facility evolutions. The degree of rigor applied to the DOE-RA was appropriate, and the assessment results are properly documented in a detailed final report. The findings and recommendations are well supported, and, for the most part, the findings were adequately justified.

Nevertheless, similar to the C-RA, planning and implementation of the DOE-RA could have been improved. For example, more time to address C-RA observations prior to the start of the DOE-RA could have been allowed, and the scope of the assessment should have been expanded to include fire protection and additional safety system related field observations. In addition, some anomalies with the fire protection program identified by this review warrant attention. These include examples of insufficient documentation to support the use of certain valves and spare parts, fire system information not described in the documented safety analyses, and a lack of an active monitoring system(s) for a credible fire scenario.

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1.0 PURPOSE

The U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA) was established in May 2014 and assumed responsibility for managing the Department's Independent Oversight Program for the Department's former Office of Health, Safety and Security (HSS). The office now called the EA Office of Environment, Safety and Health Assessments conducted an independent review of the Integrated Waste Treatment Unit (IWTU) facility Federal readiness assessment (DOE-RA) at the Idaho Site beginning March 10-15, 2014, and ending after final input and feedback from the site on April 3, 2014. This assessment was intended to assess the effectiveness of the DOE-RA process as implemented for the IWTU restart. This report discusses the scope, background, methodology, results, and conclusions of the assessment, as well as opportunities for improvement (OFIs) and items identified for further follow-up by EA.

2.0 SCOPE

The Independent Oversight program is one element of DOE's multi-faceted approach to oversight, as described in DOE Policy 226.1, *Department of Energy Oversight Policy*. Effective oversight of DOE Federal and contractor operations is an integral part of DOE's responsibility as a self-regulating agency to provide assurance of its safety and security posture to its leadership, its workers, and the public. The Independent Oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent assessment of the adequacy of DOE policy and requirements and the effectiveness of DOE and contractor line management performance in safety, security, and other critical functions as directed by the Secretary. DOE Order (O) 227.1, *Independent Oversight Program*, defines this program, which EA is responsible for implementing.

For the IWTU DOE-RA, the review team planned to assess a set of Core Requirements (CRs), as identified in their approved plan of action (POA). To evaluate the readiness assessment, a sample of the DOE-RA's CRs were selected, observed, and reviewed. Specifically, the following CRs were selected:

- CR 1: Safety Management Program (SMP) – Fire Protection
- CR 7: Safety System Surveillance.

3.0 BACKGROUND

The Idaho Site includes the Idaho National Laboratory (INL), the Idaho Cleanup Project (ICP), and the Advanced Mixed Waste Treatment Project (AMWTP). The DOE Idaho Operations Office (DOE-ID) provides direction and oversight for the design and operation of the Idaho Site nuclear facilities for the DOE Headquarters Offices of Nuclear Energy (NE) and Environmental Management (EM). NE is responsible for INL facilities and general site operations, and EM is responsible for ICP and AMWTP facilities. Within DOE-ID, two line management organizations are responsible for oversight of these nuclear facilities and their activities. The Deputy Manager for Operations Support is ultimately responsible for contractor oversight of the NE facilities, and under the Deputy Manager for ICP, oversight of the EM facilities is the responsibility of the Assistant Manager for Nuclear Safety and Performance. Currently, Battelle Energy Alliance, LLC; CH2M-WG Idaho, LLC (CWI); and Idaho Treatment Group,

LLC are, respectively, the primary contractors responsible for the management and operation of INL, ICP, and AMWTP facilities. The IWTU facility, part of ICP, is operated by the ICP primary contractor, CWI.

In June 2012, the filter and solids collection system of the IWTU facility failed during the initial plant heatup phase of operations. The facility had not yet introduced the radioactive source term into the system; therefore, no hazardous radioactive materials were released. During the event, the IWTU experienced a pressurization of the off gas system. This pressurization resulted in a Rapid Shutdown System (RSS) trip during thermal startup. The subsequent investigation largely attributed the overall cause to carbon dust generated in the IWTU steam reforming process. As a result, the facility shut down. Recovery has involved both operating and design changes, along with modification of the existing safety basis documents. Many of the design changes were driven by positive Unreviewed Safety Question (USQ) determinations that resulted from several indications of Potential Inadequacies in the Safety Analysis (PISAs). EA has been kept informed of the progress in implementing the many modifications to the facility. In addition, to maintain awareness prior to the IWTU RAs, EA visited the facility in November 2013 concurrent with a Defense Nuclear Facilities Safety Board staff visit.

DOE Order 425.1D, *Verification of Readiness to Startup or Restart Nuclear Facilities*, specifies the conditions and circumstances under which a review is required to verify the readiness of a facility to start up or restart. DOE Standard (STD) 3006-2010, *Planning and Conducting Readiness Reviews*, provides standardized methods and approaches for planning and conducting such readiness reviews that are applicable to both contractors and DOE. DOE STD 3006-2010 describes acceptable methods for meeting the requirements of DOE Order 425.1D; one such method is for DOE to perform a DOE-RA of the facility, following, or in conjunction with, an RA led by the contractor (C-RA). DOE STD 3006-2010 provides additional guidance regarding the steps necessary to carry out this review. Both DOE Order 425.1D and DOE STD 3006-2010 are applicable to the restart of the IWTU, and EM is the line management office responsible for conducting the DOE-RA.

The final POA for the DOE-RA, ICP PLN-2048, Rev. 2, was approved on January 15, 2014. The C-RA officially concluded with the approval and signoff of a supplemental report on March 7, 2014. CWI provided DOE-ID with a Readiness to Proceed memorandum on March 10, 2014. The DOE-RA team began their assessment on March 11, 2014, with an implementation plan (IP) that was approved on March 3, 2014. The DOE-RA was completed on March 21, 2014.

4.0 METHODOLOGY

The performance of the DOE-RA was assessed by evaluating the activities the DOE-RA team performed to determine how and to what degree the CRs were met for IWTU, as set forth by DOE Order 425.1D and implemented through the approved POA and IP. By choosing a sampling of these CRs and conducting concurrent assessment activities with the DOE-RA team as they performed their assessment, EA was able to compare the DOE-RA team's methods to DOE Order 425.1D requirements and DOE STD 3006-2010 guidance to independently assess the gaps between what EA observed and what the DOE-RA team found.

Because the DOE-RA did not include an assessment of the Fire Protection SMP, the scope of this review was fulfilled by assigning an EA reviewer to shadow the IWTU Fire Protection Engineer (FPE) to determine the appropriateness of excluding the Fire Protection SMP from the POA. By reviewing and understanding how fire protection was implemented for the IWTU facility, EA was able to assess what the DOE-RA could have observed if this CR had been included in the assessment. The fire protection review area also used DOE STD 3006-2010 and parts of HSS Criteria, Review, and Approach Document

(CRAD) 45-34, *Fire Protection*, as points of reference when interviewing personnel, reviewing documents, walking down the facility, and observing activities.

5.0 RESULTS

The following sections discuss the results from observations of the planning and conduct of the IWTU DOE-RA.

5.1 Readiness Assessment Planning

5.1.1 Plan of Action and Defined Scope

The DOE-RA POA, PLN-2048, was approved by the Startup Approval Authority (SAA), the DOE-ID Deputy Manager for the ICP, on January 15, 2014. The POA document is compliant with DOE Order 425.1D and is consistent with DOE STD 3006-2010 provisions. However, DOE STD 3006-2010 indicates that POAs should be prepared approximately six months before a DOE-RA commences; the SAA approved PLN-2048 less than three months before the start of the DOE-RA, on March 11, 2014. Also, beginning the DOE-RA just four days after the final report of the C-RA did not provide sufficient time for C-RA Findings and other observations to be thoroughly understood and resolved. Although not directly in violation of any DOE rule or regulation, these decisions on the timing of key assessment milestones reflect what could be deemed non-conservative decision-making, when considering the first-of-a-kind nature of this facility and the track record of engineering challenges that have been encountered. (See **OFI-IWTU-DRA-01**.)

The purpose of the DOE-RA was to demonstrate that the IWTU facility and staff are ready to safely resume initial facility start-up testing. Following the June 16, 2012, over pressurization event, CWI took corrective actions and made facility modifications that addressed the overpressure event and also addressed broader aspects of facility safety. DOE O 425.1D and DOE STD 3006-2010 allow RAs to be tailored to suit the specifics of the restart activity, but RAs also must be based, in part, on the status of and changes to the facility, operating procedures, safety basis documents, hazards, operating conditions, and personnel. The order further requires that each CR be evaluated, with a justification for excluding any CR. PLN-2048 included an evaluation of all 14 CRs with justified tailoring to address facility changes and corrective actions since the June 2012 over pressurization event. EA found that the method of determining the scope defined in PLN-2048 met the expectations of DOE O 425.1D.

However, a number of modifications were not specifically identified for review during the DOE-RA. Moreover, EA identified a clear nexus between the engineering and design changes that have been made to IWTU and how the fire protection program was implemented throughout the facility, as evidenced by the various fire system modifications and analyses that have been performed since the over pressurization event. Consequently, the Fire Protection SMP of CR 1 should have been included in the scope of the DOE-RA. Instead, Appendix A of PLN-2048, *Core Requirements Applicable to DOE Readiness Assessment*, reveals that this SMP was excluded from the assessment. The Appendix A table, which details what aspects of each CR will be assessed in the RA, shows that, for CR 1, only Procedures Management, Conduct of Operations, Emergency Preparedness, Personnel Training, Radiation Protection, Waste Management, and Work Planning and Control/Maintenance Processes would be assessed for the DOE-RA. It was appropriate to assess each of these SMPs, but the Fire Protection SMP was no less pertinent to this RA process, and in many cases, the fire hazards may be even more significant than other hazards. The C-RA scope was similarly limited. (See **OFI-IWTU-DRA-02** and **OFI-IWTU-DRA-03**.)

Formally expanding the scope of the DOE-RA to address fire protection, would have systematically provided a more thorough assessment and would have helped to address areas that may have been missed by the C-RA. However, EA noted that the DOE-RA team did not limit its inquiries to the narrow scope of the assessment and that a DOE-RA assessor did in fact review the IWTU Fire Hazard Analysis (FHA), HAD-434, and work packages associated with some fire protection modifications. This effort did not necessarily provide performance-based assessment data, but the decision by the DOE-RA assessors helped to make the RA process more effective.

During the assessment, the DOE-RA team requested that CWI consider heat up of the IWTU Granulated Activated Charcoal (GAC) Beds of the Process Off-gas System, though this was not explicitly included in the scope of the DOE-RA. The Defense Nuclear Facilities Safety Board (DNFSB) staff observing the DOE-RA supported this request. After appropriate deliberation and consideration of the challenges associated with heatup of the GAC Bed and startup of the Process Off-gas System, CWI agreed to do so. In the process of heating up the GAC Beds, the facility entered a Limiting Condition for Operation (LCO), and operators placed IWTU into warm standby mode.

It is noted in Section 3.2 of DOE STD 3006-2010, that an RA need only evaluate selected elements necessary for determining readiness to start nuclear operations, because other identified elements are in a known and satisfactory condition that has previously been evaluated. As the Process Off-gas System had not been previously evaluated for readiness while in operation, its condition was not known to be satisfactory at the time of this DOE-RA, and the DOE-RA team's request to start the system during the review was appropriate.

However, earlier planning to include this action in the POA would have been far more effective. Though DOE STD 3006-2010 does not explicitly guide the development of a POA that requires operability of all systems prior to review, requiring the Process Off-gas System to be placed into operation as a prerequisite for the DOE-RA would have allowed a more thorough assessment of IWTU safety-significant controls, most of which are directly associated with that system. Furthermore, requiring the system to be in operation before or during the DOE-RA would have helped alleviate previously identified EA concerns about the adequacy of the assessment of safety-significant systems prior to startup. (See Section 5.2.2 of this report and **OFI-IWTU-DRA-04**.)

This concern and associated opportunities for improvement were previously expressed following the assessments of the three previous readiness reviews performed for IWTU, as reported in *Independent Oversight Review, Sodium Bearing Waste Treatment Project - Contractor - June 2012*; *Independent Oversight Review, Sodium Bearing Waste Treatment Project - Federal - June 2012*; and *Independent Oversight Review, Idaho Cleanup Project - August 2014*.

5.1.2 Implementation Plan

According to DOE Order 425.1D, the RA team must develop an RA IP. The order further requires that the IP document the evaluation criteria and review approaches based on the scope given in the RA POA.

The DOE-RA POA IP was found to be compliant with the POA, as approved by the SAA. The format and content of the IP are consistent with DOE STD 3006-2010.

5.1.3 Team Qualifications

Each DOE-RA team member appeared to exhibit the technical knowledge and experience in the respective area assigned for assessment. In addition, each team member has experience in performance-based assessment processes and methods. The team members are independent of the IWTU line

organization and were able to fully support the DOE-RA team leader and assigned area(s) of responsibility.

Based on team member resumes and direct observation of DOE-RA performance, the DOE-RA team meets the expectations of DOE O 425.1D and DOE STD 3006-2010.

5.2 Conduct of the Assessment

Independent oversight of the C-RA team was conducted by concurrently observing operational activities during the TI-102 (testing) phase of restart. As discussed in Section 4.0, the DOE-RA did not officially assign a reviewer to cover the Fire Protection SMP. Therefore, through independent assessment, EA was able to determine what the DOE-RA could have observed if this CR had been included in the DOE-RA POA. The results are organized in accordance with the CRs selected for assessment, as noted in Section 3.0 above.

5.2.1 CR 1: Safety Management Program – Fire Protection

For IWTU, the current FHA is documented in Revision 7 of HAD-434, *Combination Fire Hazards Analysis/Fire Safety Assessment for the Integrated Waste Treatment Unit*. Revision 6 of the FHA was in place during initial startup, and Revision 7 incorporated fire analyses of carbon dust accumulation downstream of the process-gas filter. The USQ performed on the FHA describes, in detail, the changes that were made between revisions. Other key documents were identified and reviewed supporting the DOE-RA, which were listed in TBL-406, *Idaho Cleanup Project SSC Technical Baseline Verification and Validation for the IWTU Fire Protection*, and approved by the IWTU FPE.

Below are some key observations made while interviewing and observing the IWTU FPE and reviewing program documentation. (See **OFI-IWTU-DRA-03**.)

Isolation Valve Modification

CWI performed a number of facility and procedural modifications to support restart of IWTU operations. These modifications included adding manual isolation valves in the existing fire water deluge system lines to the process high efficiency particulate air (HEPA) filter banks, allowing more complete isolation from the on-line filter banks for filter change out. The change was completed by Facility Design Change (FDC) 8556, Add Isolation Valves to Process HEPA Fire Water Lines. Piping and instrument diagram (P&ID) 632797, *Intec CPP-1696 Integrated Waste Treatment Unit Piping & Instrument Diagram Process HEPA Filters*, was revised to show the addition of the valves and the removal of 1-inch fire water lines.

The fire sprinkler isolation valve that was installed included a Sharpe 1-inch stainless steel lockable extended stem valve. Valves that are connected to fire systems are required to be listed for their intended service in accordance with the requirements of National Fire Protection Association (NFPA)-13, *Standard for the Installation of Sprinkler Systems*. The Sharpe valve manufacturer data sheet does not indicate this required listing and thus does not support the valve being judged acceptable for installation at IWTU. (See **OFI-IWTU-DRA-03**.)

Critical Spare Parts Listing

There is a list of Quality Level (QL)-2 spare parts that were procured for the Alison Control Linear Temperature System, as well as a list of QL-3 spare parts for this system. The Critical Spare Parts List, IDF-10184, includes only one item that is not consistent with the safety significant component list identified in the IWTU safety analysis report (SAR)-219, Chapter 4, Table 4-5, *Linear Temperature*

Detection - Safety Significant Components). The commercial grade dedication plan for spare parts for the safety-significant thermal detection system is not reflected in the Critical Spare Parts List.

Dust Control - Tubular Conveyor

The additive system is composed of three subsystems: storage, conveyor, and feeder. The storage system comprises two coal and one coke storage silos in Room 124 of the IWTU facility, as well as the bag filter system handling the dust from the silo vents. The conveyor system comprises a coal conveyor tube and a coke conveyor tube. Each tube is built as a loop beginning at the storage silo(s) to the conveyor motor to an outlet funnel filling a feeder hopper, and a return tube back to the storage silo(s). The feeder system comprises a denitration mineralization reformer (DMR) feeder skid, which is connected to the coal storage by the coal conveyor, and a carbon reduction reformer (CRR) feeder skid, which is connected to the coke storage by the coke conveyor. The DMR feeder skid includes a coal hopper (filled automatically by the coal conveyor) and a fluidized bed (FB) media hopper (filled manually). Both hoppers have automated feeders leading to the DMR accumulation funnel, which leads to the DMR airlock, which in turn leads to the DMR additive addition line. The CRR feeder skid includes a coke hopper (filled automatically by the coke conveyor), and an FB media hopper and an aluminum hydroxide hopper (both filled manually). The three hoppers have automated feeders leading to the CRR accumulation funnel, which leads to the CRR airlock, which in turn leads to the CRR additive addition line.

Because of combustible dust hazards, there is a potential for a deflagration starting from the silos in Room 124 to the additive feed hoppers, which needs to be adequately protected against. The conveyor system represents a significant hazard for collecting combustible dust and presents a similar hazard, which needs to be controlled. Research and analysis indicate that the dust hazard would likely be more significant at the additive hoppers than at the silos due to particle size and concentration. SAR-219, Table 3-10, describes the cause for fire or deflagration as resulting from ignition of coal in the feed silo or feed system. The IWTU SAR does not describe the feed system; as a result, it does not provide full understanding of where this fire/deflagration scenario begins and ends as it relates to a potential deflagration.

The design features addressing this fire/deflagration scenario include maintaining the CRR and DMR feed hopper and feed pot under an inert nitrogen atmosphere; however, there is no active monitoring beyond Room 124 to confirm that the nitrogen purge is adequate for the anticipated concentration of coal. The monitoring of oxygen does not take into account the incidental leakage that occurs at the additive feed hoppers and conveyers. This was evident, as EA observed aluminum tape applied to the seals of the additive feed hoppers to reduce the leakage of coal dust. The hazard associated with this condition would be increased during startup of the system, due to dust that has accumulated in the conveyer system. Administrative controls, including operator rounds, may not be sufficient to adequately mitigate the hazard of dust explosions and ensure that the oxygen level remains below 60% of the limiting oxygen concentration (LOC). (See **OFI-IWTU-DRA-03**.)

Flammable Dust Hazard Management Plan

The Flammable Dust Hazard Management Plan provides an approach for implementing the requirements in NFPA-69, *Standard on Explosion Prevention Systems*, and NFPA-654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, necessary for controlling the coal/coke dust deflagration hazard in the additive system. IWTU management has documented commitments for implementing these requirements in PLN-3793, Rev. 3, *Flammable Dust Hazard Management Plan*, which identifies dust control and housekeeping practices, ignition sources, oxygen monitoring objectives, and process related equipment to ensure that the hazards associated with a dust explosion are adequately mitigated and meet the minimum NFPA requirements. A commitment for managing the dust hazards included a “performance-based assessment” to be performed

during the IWTU testing period involving coal/coke operations. As of the completion of this assessment in March 2014, EA found no evidence that this assessment had been performed. The responsible staff indicated that the performance-based assessment had been deferred pending operations, and was likely to be completed just prior to the scheduled facility outage. (See **OFI-IWTU-DRA-03**.)

5.2.2 CR 7: Safety System Surveillance

DOE O 425.1D, Section 4.f.(7) discusses the CR to have a program in place to periodically reconfirm the condition and operability of vital safety systems. The DOE-RA IP defines Criteria for multiple Objectives, including ENG and NS.1, to guide the assessment of this CR. The DOE-RA team assessors sought to accomplish these Objectives by using an appropriate variety of assessment activities, including a review of drawings, procedures, and maintenance work packages. The DOE-RA assessors also interviewed key personnel, such as cognizant system engineers, operations managers, and control room operators. Based on its review, the DOE-RA team appropriately determined that the Criteria addressing this CR had been met. Appropriate staff members were interviewed, and adequate lines of inquiry were used to determine that staff had the necessary knowledge and understanding of the surveillance and implementation of safety structures, systems, and components (SSCs).

In addition to the document reviews and interviews, the DOE-RA assessors observed system walkdowns and the performance of normal operations. However, for the safety-significant SSCs, the DOE-RA team only participated in tabletop reviews of the High Temperature Protection System (SIF-2) and High Carbon Monoxide (CO) Detection System (SIF-3). It would be far more effective to observe a thorough sample of the surveillance testing program at IWTU. The guidance of DOE STD 3006-2010 suggests a comprehensive evaluation of a vertical slice of at least two safety-related functions; however, EA recommends that readiness reviews observe a complete vertical slice of as many safety-class and safety-significant system surveillances and calibrations as possible, or as many as are sufficient, to provide confidence in the processes. This is discussed further in the June 2012 EA report, *Independent Review of the Sodium Bearing Waste Treatment Project-Integrated Waste Treatment Unit Federal Operational Readiness Review*. (See **OFI-IWTU-DRA-04**.)

From this limited assessment, IWTU appears to have a surveillance program in place with appropriate implementing procedures and knowledgeable personnel. The DOE-RA team adequately assessed the IWTU surveillance program to this CR, in accordance with its defined prerequisites, and in preparation for this restart.

6.0 CONCLUSIONS

Overall, the DOE-RA was executed as planned by an experienced, critical DOE-RA team that followed the approved POA and IP. The DOE-RA team reviewed applicable documentation, observed work activities, and was well prepared to evaluate the observed evolutions. The degree of rigor applied to the DOE-RA was appropriate, and the assessment results are properly documented in a detailed final report. The findings and recommendations are well documented, and, for the most part, designation of findings is adequately justified.

Nevertheless, just as with the C-RA, EA identified that the planning and implementation of the DOE-RA could have been improved. For example, more time to address C-RA observations should have been allowed, and the scope of the assessment should have been expanded to include fire protection and additional safety system related field observations. In addition, EA identified some issues with the fire protection program that warrant timely management attention, such as instances of insufficient

documentation to support the use of certain valves and spare parts, information not described in the SAR, and a lack of active monitoring for a credible fire scenario.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the following OFIs. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management organizations and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

OFI-IWTU-DRA-01: Ensure that future readiness review POAs are prepared at least six months in advance to ensure adequate preparation time and to prevent the review from impacting the schedule for determining readiness. Also, ensure adequate time is allowed to make improvements and resolve observations associated with preceding readiness reviews.

OFI-IWTU-DRA-02: Consider liberally expanding the scope of readiness reviews for all nuclear projects that have experienced recent challenges in achieving initial or sustained operations.

OFI-IWTU-DRA-03: Consider conducting a thorough review of Fire Protection SMP implementation at IWTU, to assess installed fire systems and facility changes that were not reviewed during either the C-RA or DOE-RA. The following are some potential focus areas:

- Fire water deluge system manual isolation valve modification,
- Critical spare parts listing,
- Dust control, and
- Flammable dust hazard management performance-based assessment.

OFI-IWTU-DRA-04: Ensure that the readiness review observes a complete vertical slice of a sufficient number of safety-class and safety-significant system surveillances and calibrations to provide confidence in the processes. The provisions of the safety basis CR, DOE STD 3006-2010, Appendix 3, *Readiness Review Writing Guide*, should be considered in designing a well-sampled review, particularly the following provision of the standard:

> *Note: A vertical slice of at least two safety-related functions should be subject to comprehensive evaluation, from the identified hazard through implementation of the selected control. In addition, in conjunction with the Maintenance functional area, at least two SSCs will be subject to a vertical slice, from determination of the safety function, required surveillances and calibrations, development of the TSRs and subsequent procedures, and the records of accomplishment determining that the SSCs were operable. If the selected safety functions involve SACs, those also should be subject to the vertical slice approach to ensure they are appropriate and adequately implemented.*

8.0 FOLLOW-UP ITEMS

EA will continue to maintain operational awareness of the TI-102 testing process and any independent assessments of IWTU readiness.

Appendix A
Supplemental Information

Dates of Review

Onsite Review: March 10-15, 2014

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Appendix B
Documents Reviewed, Interviews, and Work Evolutions

Documents/Records Reviewed

- SAR-219, Documented Safety Analysis for the Integrated Waste Treatment Unit, Rev. 7
- TSR-219, Technical Safety Requirements for the Integrated Waste Treatment Unit, Rev. 4
- Safety Evaluation Report for the Documented Safety Analysis and Technical Safety Requirements (SAR-219 Rev. 7 and TSR-219 Rev. 4) for the Integrated Waste Treatment Unit (CPP-1696) at the Idaho Nuclear Technology and Engineering Center, 2/11
- SAR-100, ICP Standardized Safety Analysis Report (SAR) Chapters, Rev. 12
- HAD-434, "Combination Fire Hazards Analysis/Fire Safety Assessment for the Integrated Waste Treatment Unit," Rev. 6, May 2, 2012
- HAD-434, "Combination Fire Hazards Analysis/Fire Safety Assessment for the Integrated Waste Treatment Unit," Rev. 7, February 28, 2013
- HAD-434, "Combination Fire Hazards Analysis/Fire Safety Assessment for the Integrated Waste Treatment Unit," Rev. 8, November 21, 2013
- Idaho Cleanup Project SSC Technical Baseline Verification and Validation for the IWTU Fire Protection, TBL-406, Rev 4, January 2, 2014
- Flammable Dust Hazard Management Plan, PLN-3793, Rev. 3, December 28, 2013
- IDF-10184, Critical Spare Parts List
- ESS-115, "Evaluation of the Safety of the Situation for Granulated Activated Carbon (GAC) Bed Flow New Information," Rev. 0, June 21, 2013
- USQ-14220, "PLN-3793, Revision 3, Flammable Dust Hazard Management Plan (DRF 338479)," December 28, 2013
- USQ-13994, "HAD-434, Revision 8, Combination Fire Hazards Analysis/Fire Safety Assessment for the Integrated Waste Treatment Unit (DRF 340117)," November 5, 2013
- USQ-13338, "FDC 8997, DMR Auger Grinder Modifications," April 24, 2013
- USQ-13383, "FDC 9025, IWTU – Replace Valve on DMR Drain Line (FCF 8527)," May 14, 2013
- USQ-13999, "FDC 9410, IWTU- Replace Root Valve to Increase Nitrogen Flow," November 1, 2013
- USQ-13324, "Granular Activated Carbon (GAC) Bed Flow New Information," Rev. 1, June 6, 2013.
- FDC-8789, "High IWTU Additional Changes to DCS Rapid Shutdown"TPR-7900, "IWTU—Preparation for Startup"
- SDD-242, "IWTU—Fire Protection"
- Management Control Procedure (MCP)-1519, ICP Projects Requirement Change Implementation.
- FRM-579, Integrated Waste Treatment Unit Safety Basis Implementation
- EAR-300, "IWTU—219 LCO Actions," Rev. 11, December 17, 2013
- FRM-579, "ICP Project Change Implementation Strategy," November 21, 2013
- Model Work Order 636523, (MO6) SSIS Proof Test for SIF-2 Components, December 5, 2013
- FRM-1102, "IWTU—Daily TSR-219 Instrument Surveillance," June 3, 2012–June 5, 2012, and June 17, 2012–June 19, 2012

Interviews (Observed C-RA Team)

- IWTU Fire Protection Engineer
- IWTU Coal Conveyor System Engineer

- IWTU Safety Analysis Manager
- IWTU Nuclear Safety Manager
- IWTU Chief Engineer
- IWTU Control Room Operators
- IWTU Outside Operators
- IWTU Test Engineers
- DOE-RA Team Assessors
- DOE-RA Team Lead

Work Evolutions and Demonstrations (Observed DOE-RA Team)

- DOE-RA Team Meetings
- IWTU Staff Meetings
- IWTU GAC Bed Heat-Up Planning Meeting
- Multiple IWTU System Walkdowns